Vegetation Resources Inventory

The B.C. Land Cover Classification Scheme

Prepared by
Ministry of Sustainable Resource Management
Terrestrial Information Branch
for the Terrestrial Ecosystems Task Force - Vegetation
Resources Inventory Committee

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The Resources Inventory Committee consists of representatives from various ministries and agencies of the Canadian and the British Columbia governments as well as from First Nations peoples. RIC objectives are to develop a common set of standards and procedures for the provincial resources inventories, as recommended by the Forest Resources Commission in its report "The Future of our Forests".

For further information about the Resources Inventory Committee and its various Task Forces, please access the Resources Inventory Committee Website at:
http://www.for.gov.bc.ca/ric.

Terrestrial Ecosystems Task Force

The Vegetation Inventory Working Group was formed in 1993 and issued their final report in March 1995 on a "Proposed New Inventory" for British Columbia. The Ministry of Forests, Resources Inventory Branch, in cooperation with the Ministry of Environment, other Ministry of Forests branches, and consultants, developed the suite of Vegetation Resources Inventory Procedures based on the recommendations in that report. Many individuals were involved in writing the original version of the various Vegetation Resources Inventory Procedures documents.

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Table of Contents

Acknowledgments iii
BC Land Classification System 1
Introduction 1
Who will use the information? 1
Classifying Land Cover 2
Polygon Attribute - The Information Source for the Cover Designation 2
The Coding System 3
Level 1 - Classifying the Land Base 6
Classifying Vegetated Polygons 6
Level 2 - Land Cover Type 6
Level 3 - Landscape Position 7
Level 4 - Vegetation Type 7
Level 5 - Density Class 9
Classifying Non-Vegetated Polygons 10
Level 2 - Land Cover Type 10
Classifying Non-Vegetated Land Polygons 10
Level 3 - Landscape Position (Land) 10
Level 4 - Non-Vegetated Cover Type (Land) 11
Level 5 - Non-Vegetated Categories (Land) 11
Classifying Non-Vegetated Water Polygons 13
Level 3 - Landscape Position (Water) 13
Level 4 - No Level 4 for Water 14
Level 5 - Water Categories 14
Literature Cited 15
Appendix A - Land Cover Classification Criteria 17
Appendix B - Definitions 18
Vegetated Land Definitions 18
Non-Vegetated Land Definitions 19
Wetland Definitions 21

Appendix C - The B.C. Tree Code List 23
Appendix D - Low Woody Species and Intermediate Life Forms 27
Appendix E - Discussion of the B.C. Land Classification Scheme 30
Index 35

List of Figures

Figure 1 - Structure of the B.C. Land Cover Classification Scheme - Vegetated polygons 4
Figure 2 - Structure of the B.C. Land Cover Classification Scheme - Non-Vegetated polygons 5

BC Land Classification System

Introduction

The Vegetation Inventory Working Group, a component of the Resources Inventory Committee (RIC), was given the task of creating a land cover classification system to meet the needs of British Columbia's resource managers today and in the future. Present inventory systems were found to be inadequate when used to assess integrated resource management options. It was from this perspective, along with growing world-wide demand for an accurate assessment of land cover, that the classification scheme was created.

The B.C. Land Cover Classification Scheme was designed to meet present provincial and national needs, and to be capable of providing data for global vegetation accounting as proposed by Bones (1993) for the Forest Resources Division of the Food and Agriculture Organization of the United Nations (FAO). In designing the B.C. system, the working group examined a number of classification systems, including Dansereau 1957, Küchler 1967, Fosberg 1967, Ellenberg and Mueller-Dombois 1967 (UNESCO), Ellenberg 1973, National Vegetation Working Group 1990, Viereck et al. 1992, Alberta Forestry, Lands and Wildlife 1992, and Bones 1993. The intent was to make a useful functional system for B.C. while retaining compatibility with other systems. The new classification will take the place of the old timber-based inventory system.

The B.C. Land Cover Classification Scheme meets all 12 criteria suggested by Bones (1993) for international standard forest definitions and classifications (see Appendix A for a list of the 12 criteria). The B.C. system embraces the first criteria that the classification be based on current cover (vegetated or non-vegetated), not on climax or potential cover. As well, the revised system has no culturally biased terms such as the old term "non-productive brush." This provides an unbiased assessment of what exists at the time of the inventory, not what potentially could exist. Beyond the classification levels, additional attributes can be specified to provide more information on a described unit. For example, the plant association found on the site or the silvicultural treatments done on that unit can be described.

This manual describes the various steps and levels in the classification system. A schematic of the classification is shown in Figures 1 and 2 to help visualize the entire system. Appendix B provides definitions of all classes used. Appendix E provides a comparison of the B.C. Scheme with other systems.

Who will use the information?

The B.C. classification system will be used as a baseline for resource managers when making integrated resource management decisions. For example, information will be available to wildlife managers on the extent of various vegetation communities, such as the location of areas covered by browse species. Hydrologists will have access to information on vegetation cover relating to hydrological green-up on a drainage-by-drainage basis. Range managers will be able to assess the extent of grass- and herb-dominated sites when determining range options. Timber managers will be provided with an assessment of the timber resource, including all of the present information and additional details on adjacent land cover. The

classification will also provide snapshots of land cover that can be used as benchmarks for tracking global and local changes.

Classifying Land Cover

The B.C. Land Cover Classification Scheme is based on current cover. Cover can be vegetated, non-vegetated or unreported. Vegetated cover is either treed or non-treed; non-vegetated cover is either land or water. In most cases, uniform areas (polygons) are delineated on mid-scale aerial photographs (1:10 000 to 1:20 000). Each polygon is then assessed using hierarchical classes, first into Vegetated, Non-Vegetated, or Unreported, then by cover type, landscape position, and so on, to the lowest level identifiable.

Below is a decision chart for the classification scheme. Figures 1 and 2 illustrate the classification scheme structure for vegetated and non-vegetated areas, respectively. Unreported areas may be vegetated or non-vegetated, but their attributes are either unknown (as in the case of parks) or they are outside the area being reported (as in the case of Tree Farm Licenses or Tree Farms).

The B.C. Land Cover Classification Scheme Decision Chart

Level 1 - Vegetated or not
Level 1 - Vegetated (has 4 further levels)
- Level 2 - Land cover type - Treed or Non-Treed
  - Level 3 - Landscape position - Wetland, Upland, or Alpine
    - Level 4 - Vegetation type (varies with Treed or Non-Treed unit)
      - Level 5 - Density class

Level 1 - Non-Vegetated (has 4 further levels)
- Level 2 - Land or Water
- Level 2 - Land
  - Level 3 - Landscape position - Wetland, Upland, or Alpine
    - Level 4 - Cover type
      - Level 5 - Cover categories
- Level 2 - Water
  - Level 3 - Landscape position - Wetland, Upland, or Alpine
    - Level 4 - none for Water
      - Level 5 - Water categories

Polygon Attribute - The Information Source for the Cover Designation

Application of the B.C. Land Cover Classification Scheme provides a land cover designation based on the categories described below. The cover for each polygon is derived from polygon attributes estimated by photo interpretation and calibrated by air and ground surveys. Attribute estimation from air photos is described in the Vegetation Resources Inventory Photo Interpretation Procedures.

The land cover designation provides a categorization of the polygon based on the BC Land Cover Classification Scheme. Lower layer (such as shrubs, herbs, and bryoids) vegetation information is not provided as part of the map label when a higher layer (such as trees) exists. Data are available for the other layers within the polygon attribute file. Resource managers can access various levels of detail, depending on their objectives.

The Coding System

The land classification of each polygon is summarized as a seven-letter code to facilitate broad land classification reporting. The classification scheme also provides the criteria for distinguishing cover types within the polygon. These criteria are critical for assessing specific tree, shrub, herbaceous, bryoid, and non-vegetated communities within polygon boundaries (referred to as land cover components). Code letters are given in the detailed descriptions that follow.

The following is an example of the derivation of the seven-letter Land Cover Class Code:

Level	Estimated attributes	Code assigned
1	Vegetated crown closure ≥5%	V (Vegetated)
2	Tree crown closure ≥10%	T (Treed)
3	Not Wetland	U (Upland)
4	Coniferous ≥75% of total Crown Closure	TC (Treed-Coniferous)
5	Tree crown closure = 80%	DE (Dense)

The Land Cover Class Code for this polygon would be VTUTCDE.

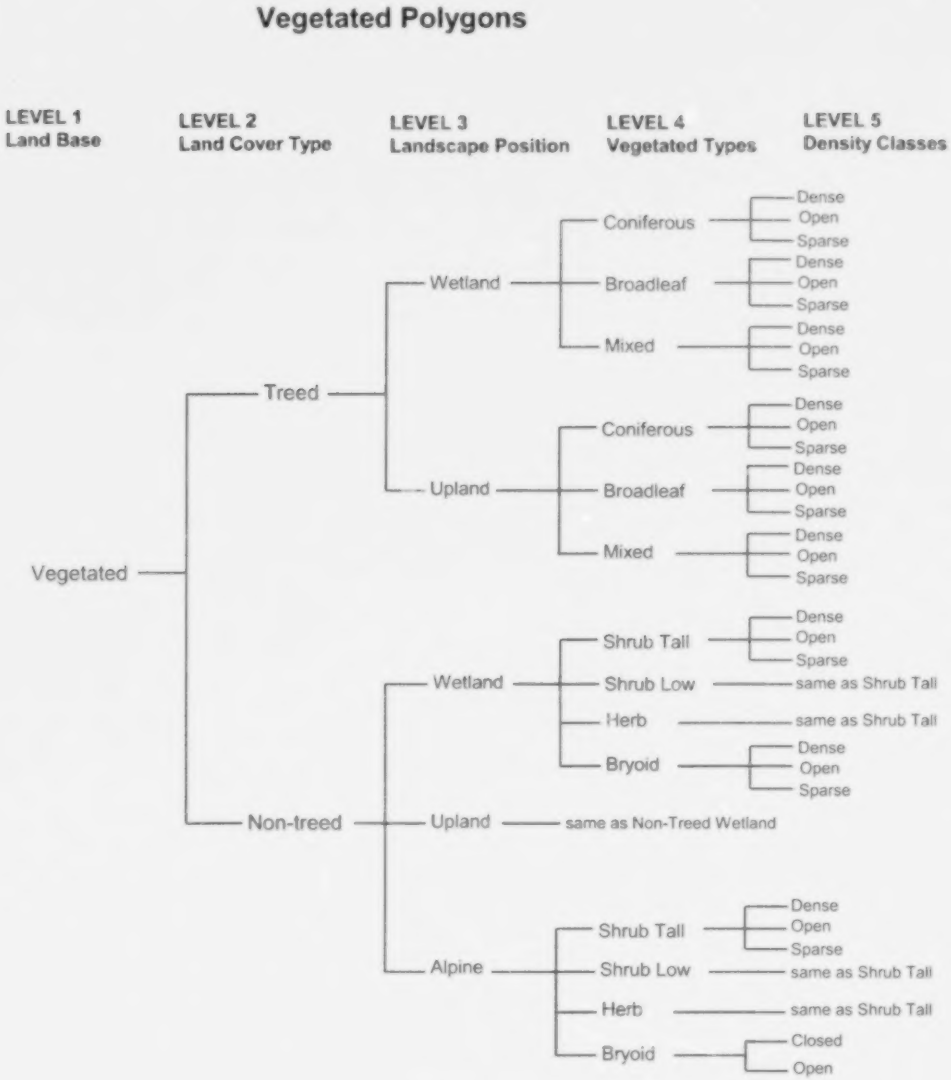

Figure 1 - Structure of the B.C. Land Cover Classification Scheme - Vegetated polygons

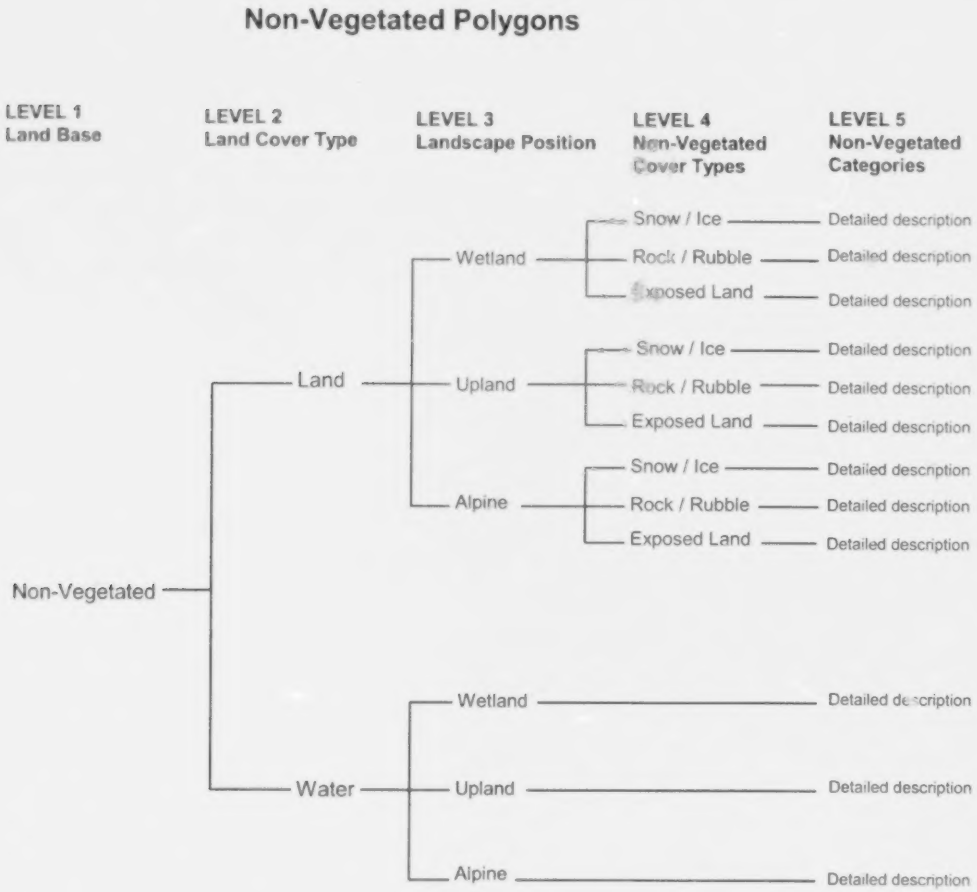

Figure 2 - Structure of the B.C. Land Cover Classification Scheme - Non-Vegetated polygons

Level 1 - Classifying the Land Base

The first level of the classification scheme classifies the presence or absence of vegetation, as Vegetated, Non-Vegetated, or Unreported.

V = Vegetated
A polygon is considered Vegetated when the total cover of trees, shrubs, herbs, and bryoids (other than crustose lichens) covers at least 5% of the total surface area of the polygon.

N = Non-Vegetated
A polygon is considered Non-Vegetated when the total cover of trees, shrubs, herbs, and bryoids covers less than 5% of the total surface area of the polygon. Bodies of water are to be classified as Non-Vegetated.

U = Unreported
A polygon is classified as Unreported if it is within the mapsheet being reported on, but is outside the inventory unit of interest. The Unreported designation is restricted to areas where inventory information is not currently available. Examples include National Parks, Provincial Parks (where information is not available), Tree Farm Licences and Tree Farms that are not in the existing vegetation cover databases, and areas outside of the Province of British Columbia.

Classifying Vegetated Polygons

If the polygon is classed as Vegetated the following levels apply.
(If classified as Non-Vegetated see *Classifying Non-Vegetated Polygons* for a description of further levels.)

Level 2 - Land Cover Type

The first determination for Vegetated polygons is whether they are Treed or Non-Treed.

T = Treed
A polygon is considered Treed if at least 10% of the polygon area, by crown cover, consists of tree species of any size. See Appendix C for a list of tree species for B.C.

N = Non-Treed
A polygon is considered Non-Treed if less than 10%, by crown cover, of the polygon area consists of tree species of any size.

Note: Tree species less than 10 m high are not classed as shrubs (as they are in ecological surveys).

Level 3 - Landscape Position

Once the polygon has been classified into Treed or Non-Treed, the location relative to elevation and drainage is determined.

W = **Wetland**
Wetland has numerous definitions in the literature. The definition used for the classification is taken from Fraser et al. (1995):

Wetland is defined as land having the water table at, near or above the soil surface that remains saturated for a long enough period of time to promote wetland or aquatic processes. These processes are indicated by the presence of Organic or Gleysolic soils and hydrophytic vegetation. See Appendix B for a more complete definition of Wetland.

U = **Upland**
A broad class that includes all non-wetland ecosystems below Alpine that range from very xeric to hygric soil moisture regimes.

A = **Alpine**
Treeless (for practical purposes less than 1% tree cover can be included within the Alpine category), with vegetation dominated by shrubs, herbs, graminoids, bryoids, and lichens. Much of the Alpine is dominated by rock, ice, and snow. Alpine does not typically include the parkland and krummholz forest types. Alpine is a classification level of Non-Treed areas above the tree line only.

Level 4 - Vegetation Type

Once the polygon is classed as Treed or Non-Treed and determined whether it is Wetland, Upland, or Alpine, it is further classified by the type of vegetation within the unit:

Vegetated Treed

Treed units can be either Coniferous, Broadleaf, or Mixed.

TC = **Treed – Coniferous**
Defined as those trees found in B.C. within the order Coniferae. These species are commonly referred to as conifer or softwoods. See Appendix C for a list of B.C. species and species codes.

The polygon is classified as Coniferous when trees cover a minimum of 10% of the total polygon area by crown cover, and coniferous trees are 75% or more of the total tree basal area.

TB = Treed - Broadleaf
Defined as those trees classified botanically as Angiospermae in the subclass Dicotyledoneae. These species are commonly referred to as deciduous or hardwoods. See Appendix C for a list of B.C. species and species codes.

The polygon is classified as Broadleaf when trees cover a minimum of 10% of the total polygon area by crown cover, and broadleaf trees are 75% or more of the total tree basal area.

TM = Treed – Mixed
The polygon is classified as Mixed when trees cover a minimum of 10% of the total polygon area by crown cover, but neither coniferous nor broadleaf trees account for 75% or more of the total tree basal area.

Vegetated Non-Treed Units

Non-Treed units can be either Shrub, Herb, or Bryoid.

Non-Treed Shrub

Shrubs are defined as multi-stemmed woody perennial plants, both evergreen and deciduous. A reporting break is made between Tall (greater than or equal to 2 m) and Low (less than 2 m) for wildlife management interpretation purposes. Other breaks may be used if preferred, as height data are estimated as a continuous variable.

For a polygon to be classed as Non-Treed Shrub, it must have more than 5% total vegetation cover, have less than 10% of crown cover of trees, and have a minimum of 20% ground cover of shrubs, or shrubs must constitute more than 1/3 of the total vegetation cover.

ST = Shrub Tall
A Shrub polygon with average height greater than or equal to 2 m.

SL = Shrub Low
A Shrub polygon with average shrub height less than 2 m.

Non-Treed Herb

Herbs are defined, for this system, as vascular plants without a woody stem, including ferns, fern allies, some dwarf woody plants, grasses, and grass-like plants. See Appendix D for a list of low woody species and species of doubtful life form assigned for this classification to the herb layer.

The Herb class has two further subdivisions based on the proportion of forbs and graminoid plants. The subclasses Forbs and Graminoids are used when any one group accounts for greater than 50% of the herb cover.

Graminoids are defined as herbaceous plants with long, narrow leaves characterized by linear venation; including grasses, sedges, rushes, and other related species.

Forbs are defined as herbaceous plants other than graminoids, including ferns, clubmosses, and horsetails.

For a polygon to be classed as Non-Treed Herb it must have more than 5% total vegetation cover, have less than 10% crown cover of trees, and have a minimum of 20% ground cover of herbs, or herbs must constitute more than 1/3 of the total vegetation cover, and have less than 20% shrub cover.

HE = Herb
A Herb polygon with no distinction between forbs and graminoids.

HF = Herb – Forbs
A Herb polygon with forbs greater than 50% of the herb cover.

HG = Herb – Graminoids
A Herb polygon with graminoids greater than 50% of the herb cover.

Non-Treed Bryoid

Bryoids are defined as bryophytes (mosses, liverworts, and hornworts) and lichens (foliose or fruticose; not crustose).

For a polygon to be classed Non-Treed Bryoid it must have more than 5% total vegetation cover, have less than 10% crown cover of trees, and have greater than 50% of the vegetation cover in bryoids, and herb and shrub cover must each be less than 20% crown cover.

The Bryoid class has two further subdivisions based on the proportion of bryophytes and lichens. The class is subdivided into Bryophyte or Lichen when any one group accounts for greater than 50% of the bryoid cover.

BY = Bryoids
A Bryoid polygon with no distinction between mosses and lichens by cover.

BM = Bryoid – Moss
A Bryoid polygon with mosses, liverworts, and hornworts greater than 50% of the bryoid cover.

BL = Bryoid – Lichens
A Bryoid polygon with lichens (foliose or fruticose; not crustose) greater than 50% of the bryoid cover.

Level 5 - Density Class

Once a Vegetated polygon is classed up to Level 4, density is reported using the following density classes available by vegetation type. Note that these are reporting breaks only; interpreters will estimate density in a continuous manner (from 0% to 100%).

The density classes for Treed, Shrub, or Herb polygons are as follows:

DE = Dense
Tree, shrub, or herb cover is between 61% and 100% crown closure for the polygon.

OP = **Open**
Tree, shrub, or herb cover is between 26% and 60% crown closure for the polygon.

SP = **Sparse**
Tree cover is between 10% and 25% for Treed polygons, or between 20% and 25% for Shrub or Herb polygons.

The density classes for Bryoid polygons are as follows:

CL = **Closed**
Cover of bryoids is greater than 50% of the polygon.

OP = **Open**
Cover of bryoids is less than or equal to 50% of the polygon.

Classifying Non-Vegetated Polygons

A polygon is considered Non-Vegetated when the total cover of trees, shrubs, herbs, and bryoids covers less than 5% of the total surface area of the polygon.

Level 2 - Land Cover Type

The first decision is whether a polygon is considered to be Land or a Water body. The cover type occupying greater than 50% of the polygon area is the cover type assigned.

L = **Land**
The portion of the landscape not covered by water (as defined below), based on the percentage cover area.

W = **Water**
A naturally occurring, static body of water, two or more metres deep in some portion, or a watercourse formed when water flows between continuous, definable banks. These flows may be intermittent or perennial; but do not include ephemeral flows where a channel with no definable banks is present. Islands within streams that have definable banks are not part of the stream; gravel bars are part of the stream. Interpretation is based on the percentage area covered.

Classifying Non-Vegetated Land Polygons

If the polygon is classed as Land the following steps and levels apply.
(If classed as Water see Land Cover Type - Water for a description of further levels.)

Level 3 - Landscape Position (Land)

This level describes the location of the polygon relative to elevation and drainage, and is described as Wetland, Upland, or Alpine. In rare cases, the polygon may be Alpine Wetland.

W = **Wetland**
Land having a water table near, at, or above the soil surface, or which is saturated

for a long enough period to promote wetland or aquatic processes. These processes are indicated by the presence of Organic or Gleysolic soils and hydrophytic vegetation. See Appendix B for a more complete definition of Wetland.

U = Upland
A broad class that includes all non-wetland ecosystems below alpine that range from very xeric to hygric soil moisture regimes.

A = Alpine
Treeless (for practical purposes less than 1% tree cover can be included within the Alpine category), with vegetation dominated by shrubs, herbs, graminoids, bryoids, and lichens. Much of the Alpine is dominated by rock, ice, and snow. Alpine does not typically include the parkland and krummholz forest types. Alpine is a classification of Non-Treed areas above the tree line only.

Level 4 - Non-Vegetated Cover Type (Land)

Once the polygon is classed as Non-Vegetated and determined whether it is Wetland, Upland, or Alpine, it is further classified by the type of non-vegetated condition within the unit. Non-Vegetated polygons are divided into three groups: Snow/Ice, Rock/Rubble, and Exposed Land.

SI = Snow/Ice
Defined as either glacier or snow cover.

RO = Rock/Rubble
Defined as bedrock or fragmented rock broken away from bedrock surfaces and moved into its present position by gravity or ice. Extensive deposits are found in and adjacent to alpine areas and are associated with steep rock walls and exposed ridges; canyons and cliff areas also contain these deposits.

EL = Exposed Land
Contains all other forms of Exposed Land identified by a range of subclasses.

Level 5 - Non-Vegetated Categories (Land)

Classes are defined by the dominant material or feature of the non-vegetated area.

Snow/Ice has two subclasses - **Glacier** and **Snow Cover**:

GL = Glacier
A mass of perennial snow and ice with definite lateral limits, typically flowing in a particular direction.

PN = Snow Cover
Snow or ice that is not part of a glacier, but is found during summer months on the landscape.

Rock/Rubble has four subclasses:

BR = **Bedrock**
Unfragmented, consolidated rock contiguous with the underlying material.

TA = **Talus**
Rock fragments of any size accumulated on or at the foot of slopes as a result of successive rock falls. This is a type of colluvium.

BI = **Blockfield**
Blocks of rock derived from the underlying bedrock by weathering and / or frost heaving. These have not undergone any significant down slope movement as they occur on level or gently sloping areas.

MZ = **Rubbly Mine Spoils**
Discarded overburden or waste rock moved to extract ore during a mining operation.

LB = **Lava Bed**
An area where molten rock has flowed from a volcano or fissure and cooled and solidified to form rock.

Exposed Land has 18 subclasses:

RS = **River Sediments**
Silt, gravel, and sand bars associated with former river channels and present river edges.

ES = **Exposed Soil**
Any exposed soil not covered by the other categories, such as areas of recent disturbance including mud slides, debris torrents, avalanches, or disturbances such as pipeline rights-of-way or cultivated fields, where vegetation cover is less than 5%.

LS = **Pond or Lake Sediments**
Exposed sediments related to dried-up lakes or ponds.

RM = **Reservoir Margin**
Land exposed by a drained or fluctuating reservoir. It is found above "normal" water levels and may consist of a range of substrates including gravel, cobbles, fine sediments, or bedrock.

BE = **Beach**
An area with sorted sediments reworked in recent time by wave action. It may be formed at the edge of fresh or salt water bodies.

LL = **Landing**
A compacted area adjacent to a road used for sorting and loading logs.

BU = **Burned Area**
Land showing evidence of recent burning, either natural or prescribed. Vegetation of less than 5% crown cover is present at the time of polygon description.

RZ = **Road Surface**
An area cleared and compacted for transporting goods and services by vehicles. Older roads that are used infrequently or not at all may cease to be classified as non-vegetated.

MU = **Mudflat Sediment**
Flat plain-like areas associated with lakes, ponds, rivers, or streams — dominated by fine-textured sediments, they can be associated with freshwater or estuarine sources.

CB = **Cutbank**
Part of a road corridor created upslope of the road surface by excavation into the hillside.

MN = **Moraine**
An area of debris transported and deposited by a glacier.

GP = **Gravel Pit**
An area exposed through the removal of sand and gravel.

TZ = **Tailings**
An area containing the solid waste material produced by the mining and milling of ore.

RN = **Railway Surface**
A roadbed with fixed rails, may contain single or multiple rail lines.

UR = **Urban**
Buildings and associated developments such as roads and parking areas which form an almost continuous covering of the lanscape.

AP = **Airport**
A permanent, paved or gravel area, and associated buildings and parking, used by airplanes.

MI = **Open Pit Mine**
An exposed area used to extract ore during a mining operation. This may contain associated buildings and any tailing produced by the mining and milling process.

OT = **Other**
A Non-Vegetated polygon where none of the above categories can be reliably chosen.

Classifying Non-Vegetated Water Polygons

If the polygon is classed as Water the following categories apply:

Level 3 - Landscape Position (Water)

The landscape position relative to elevation and drainage is determined.

W = Wetland
Land having a water table near, at, or above the soil surface, which is saturated for a long enough period to promote wetland or aquatic processes. These wetland processes are indicated by the presence of Organic or Gleysolic soils and hydrophytic vegetation. See Appendix B for a more complete definition of Wetland.

U = Upland
A broad class that includes all non-wetland ecosystems below alpine that range from very xeric to hygric soil moisture regimes.

A = Alpine
Treeless (for practical purposes less than 1% tree cover can be included within the Alpine category), with vegetation dominated by shrubs, herbs, graminoids, bryoids, and lichens. Much of the Alpine is dominated by rock, ice, and snow. Alpine does not typically include the parkland and krummholz forest types. Alpine is a classification of Non-Treed areas above the tree line only.

Level 4 - No Level 4 for Water

There are no classes at this level (Land Cover Type) for Water.

Level 5 - Water Categories

Four categories have been identified: Lake, Reservoir, River/Stream, and Salt Water.

LA = Lake
A naturally occurring static body of water more than two metres deep in some portion. The boundary for the lake is the natural high water mark.

RE = Reservoir
An artificial basin affected by impoundment behind a human fabricated structure such as a dam, berm, dyke, or wall.

RI = River/Stream
A watercourse formed when water flows between continuous, definable banks. Flow may be intermittent or perennial, but does not include ephemeral flow where a channel with no definable banks is present. Gravel bars are part of a stream, while islands within a stream that have definable banks are not.

OC = Ocean
A naturally occurring body of water containing salt or generally considered to be salty.

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Appendix A - Land Cover Classification Criteria

The following criteria for developing international standard forest definitions and classifications are from Bones 1993, p 176:

1. Base the system on current vegetative cover, not climax or potential.
2. Classification should be universally applicable.
3. Optimize, to the extent possible, compatibility with other regional or national land cover/land use systems.
4. Classification should be hierarchically designed (i.e., aggregatable, disaggregatable).
5. The system should be organized from the general to the specific (top down).
6. The system should be designed to take advantage of emerging technologies (e.g., digital satellite classification) using a vertical projection downward.
7. All categories and life forms (i.e., grass, shrubs, trees) must be accurately defined.
8. Classification must be repeatable from place to place (spatial) and from time to time (temporal).
9. Categories must be mutually exclusive and additive to 100% of the area.
10. The system should set minimum standards for percentage cover (based on vegetation structure, not species).
11. When possible, definitions should use standard (not scientific) terminology (i.e., terms are understandable, simple, and unbiased in meaning).
12. The system should correspond to identified use and needs.

Appendix B - Definitions

The following terms are defined for use in the B.C. Land Cover Classification Scheme.

Vegetated Land Definitions

Alpine: Treeless (for practical purposes less than 1% tree cover can be included within the Alpine category), with vegetation dominated by shrubs, herbs, graminoids, bryoids, and lichens. Much of the Alpine is dominated by rock, ice, and snow. Alpine does not typically include the parkland and krummholz forest types. Alpine is a classification level of Non-Treed areas above the tree line only.

Broadleaf: trees classified botanically as Angiospermae in the subclass Dicotyledoneae (Bones 1993). These species are referred to as hardwoods. For a listing of the species and species codes see Appendix C.

Bryoids: are defined as bryophytes (mosses, liverworts, and hornworts) and lichens (foliose or fruticose; not crustose).

Coniferous: trees classified botanically as Coniferae; cone-bearing trees having needles or scale-like leaves, usually evergreen. These species are commonly referred to as softwoods. For a listing of the B.C. species and species codes see Appendix C.

A polygon is classified as Coniferous when trees cover a minimum of 10% of the total polygon area by crown cover, and coniferous trees are 75% or more of the total tree basal area.

Forbs are defined as herbaceous plants other than graminoids, including ferns, clubmosses, and horsetails.

Graminoids are defined as herbaceous plants with long, narrow leaves characterized by linear venation; including grasses, sedges, rushes, and other related species.

Herbs: vascular plants without a woody stem, including ferns, fern allies (National Vegetation Working Group 1990), some dwarf woody plants (Luttmerding et al. 1990), grasses, and grass-like plants. See Appendix D for a list of low woody species and species of doubful life form assigned, for this classification, to the herb layer.

Krummholz: scrubby, stunted growth form of trees, often forming a characteristic zone at the limit of tree growth at high elevations.

Non-Treed: a polygon is considered Non-Treed if less than 10%, by crown cover, of the polygon area consists of tree species of any size.

Parkland: landscape characterized by strong clumping of trees due to environmental factors.

Shrubs: multi-stemmed woody perennial plants, both evergreen and deciduous. A reporting break is made between Tall (2 m or more) and Low (less than 2 m) for wildlife management

interpretation purposes. Other breaks may be made, as height data are estimated as a continuous variable.

Treed: a polygon is considered Treed if 10% or more of the polygon area, by crown cover, consists of tree species of any size. See Appendix C for a list of tree species for B.C.

Upland: a broad class that includes all non-wetland ecosystems below Alpine that range from very xeric to hygric soil moisture regimes.

Vegetated: a polygon is considered Vegetated when the total cover of trees, shrubs, herbs, and bryoids other than crustose lichens covers at least 5% of the total surface area of the polygon.

Wetland: is defined as land having the water table at, near, or above the soil surface, or which is saturated for a long enough period to promote wetland or aquatic processes. These wetland processes are indicated by the presence of Organic or Gleysolic soils and hydrophytic vegetation. See Wetland definitions later in this section for a more complete description.

Non-Vegetated Land Definitions

Airport (Exposed Land): a permanent, paved or gravel area, and associated buildings and parking, used by airplanes.

Beach (Exposed Land): an area with sorted sediments reworked in recent time by wave action. It may be formed at the edge of fresh or salt water bodies.

Bedrock (Rock/Rubble): unfragmented, consolidated rock contiguous with the underlying material.

Burned Area (Exposed Land): land showing evidence of recent burning, either natural or prescribed. Vegetation of less than 5% crown cover is present at the time of polygon description.

Cutbank (Exposed Land): part of a road corridor created upslope of the road surface by excavation into the hillside.

Exposed Land: contains all other forms of exposed land identified by a range of 16 subclasses: Beach; Buildings and Parking; Burned Area; Cutbank; Exposed Soil; Gravel Pit; Landing; Moraine; Mudflat Sediment; Other; Pond or Lake Sediments; Railway Surface; Reservoir Margin; River Sediments; Road Surface; Tailings.

Exposed Soil (Exposed Land): any exposed soil not covered by the other categories (e.g., areas of recent disturbance including mud slides, debris torrents, avalanches, or disturbances such as pipe line rights-of-way or cultivated fields) where vegetation cover is less than 5%.

Glacier (Snow/Ice): a mass of perennial snow and ice with definite lateral limits, typically flowing in a particular direction.

Gravel Pit (Exposed Land): an area exposed through removal of sand and gravel.

Lake: a naturally occurring static body of water more than two metres deep in some portion. The boundary for the lake is the natural high water mark.

Land: the portion of the landscape not covered by water, based on the percentage area cover.

Landing (Exposed Land): a compacted area adjacent to a road used for sorting and loading logs.

Lava Bed: an area where molten rock has flowed from a volcano or fissure and cooled and solidified to form rock.

Moraine (Exposed Land): an area of debris transported and deposited by a glacier.

Mudflat Sediment (Exposed Land): flat plain-like areas associated with lakes, ponds, rivers, or streams; dominated by fine-textured sediments. They can be associated with freshwater or estuarine sources.

Non-Vegetated: A polygon is considered Non-Vegetated when the total cover of trees, shrubs, herbs, and bryoids covers less than 5% of the total surface area of the polygon. Bodies of water are to be classified as Non-Vegetated.

Ocean: a naturally occurring body of water containing salt or generally considered to be salty.

Open Pit Mine (Exposed Land): an exposed area used to extract ore during a mining operation. This may contain associated buildings and any tailings produced by the mining and milling process.

Other (Exposed Land): a Non-Vegetated polygon where none of the other exposed land categories can be reliably chosen.

Pond or Lake Sediments (Exposed Land): exposed sediments related to dried-up lakes or ponds.

Railway Surface (Exposed Land): a roadbed with fixed rails; may contain single or multiple rail lines.

Reservoir: an artificial basin affected by impoundment of water behind a human fabricated structure such as a dam, berm, dyke, or wall.

Reservoir Margin (Exposed Land): land exposed by a drained or fluctuating reservoir; found above "normal" water levels, and may consist of a range of substrates including gravel, cobbles, fine sediments, or bedrock.

River/Stream: a watercourse formed when water flows between continuous, definable banks. Flow may be intermittent or perennial, but does not include ephemeral flow where a channel with no definable banks is present. Gravel bars are part of a stream; islands within a stream with definable banks are not.

River Sediments (Exposed Land): silt, gravel, and sand bars associated with former river channels and present river edges.

Road Surface (Exposed Land): an area cleared and compacted for the purpose of transporting goods and services by vehicles.

Rock/Rubble: bedrock or fragmented rock broken away from the bedrock surface and moved to its present position by gravity or ice. Extensive deposits are found in and adjacent to alpine areas and are associated with steep rock walls and exposed ridges. Canyons and cliff areas also contain these deposits.

Rubble, Talus, Blockfield (Rock/Rubble): fragmented rock, broken away from the bedrock surface, and moved to its present position by gravity or ice.

Rubbly Mine Spoils (Rock/Rubble): discarded overburden or waste rock moved to extract ore during a mining operation.

Snow Cover (Snow/Ice): snow or ice that is not part of a glacier, but is found during summer months on the landscape.

Tailings (Exposed Land): an area containing the solid waste material produced by the mining and milling of ore.

Urban (Exposed Land): buildings and associated developments such as roads and parking areas which form an almost continuous covering of the landscape.

Water: a naturally occurring, static body of water, two or more metres deep in some portion, or a watercourse formed when water flows between continuous, definable banks. These flows may be intermittent or perennial; but do not include ephemeral flows where a channel with no definable banks is present. Islands within a stream with definable banks are not part of the stream; gravel bars are part of the stream. Interpretation is based on the percentage area covered.

Wetland Definitions

This section is taken from Fraser et al. (1995). The wetland classification was under review at the time of this report.

Wetland: Land having a water table at, near, or above the soil surface, or which is saturated for a long enough period to promote wetland or aquatic processes. Wetland processes are indicated by the presence of Organic or Gleysolic soils and hydrophytic vegetation. Sites with subhydric soil moisture regime and wetter are generally considered to be wetlands; sites with deeper waters are aquatic ecosystems. Wetlands must have one of the following four attributes (adapted from Cowardin et al. 1979):

1. At least periodically, the land supports predominantly hydrophytic plant species.
2. The substrate is predominantly poorly drained subhydric or wetter soil. Soils may be organic or mineral; in mineral soils, gleying occurs within the top 30 cm.
3. The substrate is nonsoil and is saturated with water covered by shallow water at some time during the growing season.

4. A water body less than two metres in depth.

Wetlands can be bogs, swamps, marshes, fens, hotsprings and hotpools, alkali ponds, shrub carrs, swamps, shallow (less than 2 m) open water, and includes both forested and nonforested ecosystems. As an example, the wetland realm can be subdivided into a number of classes.

Bogs: a peat-dominated class of wetland. They are wetlands covered or filled with poorly to moderately decomposed Sphagnum-derived peats. They are nutrient poor. Soils are usually Fibrisols, Mesisols, or Humisols. In the Fort Nelson Lowlands, bogs can have Organic Cryosolic soils.

Swamps: wooded wetlands dominated by 25% or greater cover of trees or tall shrubs and characterized by periodic flooding and nearly permanent subsurface water flow through various mixtures of mineral sediments and peat. Swamps, like fens, are rich in minerals and nutrients, but the characteristic water movement through swamps tends to make them better aerated than fens. Swamp waters thus have sufficient levels of dissolved oxygen to support either tall shrubs or trees.

Marshes: wetlands that are permanently or seasonally inundated with nutrient-rich water, and support extensive cover of emergent herbaceous vegetation rooting in a mineral-rich substrate. The water level of marshes varies seasonally, and from marsh to marsh. Marshes that dry by late summer expose matted vegetation and unvegetated mudflats or sandflats, but saturation persists near the surface. The substrate ranges from dominantly mineral materials to shallow, well-decomposed peat, derived primarily from marsh vegetation. The substrate is strongly influenced by water chemistry, which in turn reflects basin geology and regional climate.

Fens: wetlands composed of accumulations of well to poorly decomposed, non-sphagnum peats. Most fens have more than 40 cm of peat accumulation. Fen waters come mostly from groundwater and runoff from adjacent mineral uplands. As a result, fens are less acid and more mineral-rich than are bogs. Fen peat is well to moderately decomposed. Associated soils are Mesisols and Humisols. Fen vegetation can be dominated by grasses, sedges, rushes, low shrubs, or trees, and often underlain by mosses.

Wet Meadows: seasonally inundated wetlands, dominated by grasses, sedges, or rushes. They generally occur on mineral soils and have little or no peat accumulation. Tree cover is less than 10%.

Shrub Carrs: wetlands that are seasonally flooded, but dry out at the soil surface during the growing season. They occur on mineral soils that are typically gleyed within the top 30 cm.

Shallow Open Water: permanent, shallow (less than 2 m midsummer levels), standing water that lacks extensive emergent plant cover. Vegetation can be absent or emergent plants can cover up to 10% of the surface. Shallow Open Waters often include various submerged and floating aquatic macrophytes. Submerged aquatic plants are common. Shallow Open Water is also found around the edges of many lakes.

Appendix C - The B.C. Tree Code List

This section lists the common name, scientific name, and codes for British Columbia trees. Trees are defined as being woody, single stemmed, and capable of growing to greater than 10 m in height.

Introduced species not known to occur on Crown Land, but requiring a code for database purposes, are indicated with an asterisk *.

From B.C. Tree Code List Version 4.1 - 5 Jan. 1999. Data Custodian: Director, Research Branch BC Ministry of Forests.

Common Name	Scientific Name	Codes	
NATIVE CONIFERS			
Cedar	***Thuja***	**C**	
western redcedar	*Thuja plicata*		Cw
Cypress	***Chamaecyparis***	**Y**	
yellow-cedar	*C. nootkatensis*		Yc
Douglas-fir	***Pseudotsuga***	**F**	
Douglas-fir	*P. menziesii*		Fd
coastal Douglas-fir	*P. menziesii* var. *menziesii*		Fdc
interior Douglas-fir	*P. menziesii* var. *glauca*		Fdi
Fir (Balsam)	***Abies***	**B**	
amabilis fir	*A. amabilis*		Ba
grand fir	*A. grandis*		Bg
subalpine fir	*A. lasiocarpa*		Bl
Hemlock	***Tsuga***	**H**	
mountain hemlock	*T. mertensiana*		Hm
western hemlock	*T. heterophylla*		Hw
mountain x western hemlock hybrid	*T. mertensiana* x *heterophylla*		Hxm
Juniper	***Juniperus***	**J**	
Rocky Mtn. juniper	*J. scopulorum*		Jr
Larch	***Larix***	**L**	
alpine larch	*L. lyallii*		La
tamarack	*L. laricina*		Lt
western larch	*L. occidentalis*		Lw
Pine	***Pinus***	**P**	
jack pine	*P. banksiana*		Pj
limber pine	*P. flexilis*		Pf

Common Name	Scientific Name	Codes	
lodgepole pine	*P. contorta*		Pl
lodgepole pine	*P. contorta* var. *latifolia*		Pli
lodgepole x jack pine hybrid	*P.* x *murraybanksiana*		Pxj
ponderosa pine	*P. ponderosa*		Py
shore pine	*P. contorta* var. *contorta*		Plc
western white pine	*P. monticola*		Pw
whitebark pine	*P. albicaulis*		Pa
Spruce	***Picea***	**S**	
black spruce	*P. mariana*		Sb
Engelmann spruce	*P. engelmannii*		Se
Sitka spruce	*P. sitchensis*		Ss
white spruce	*P. glauca*		Sw
spruce hybrid	*Picea* cross		Sx
Engelmann x white	*P. engelmannii* x *glauca*		Sxw
Sitka x white	*P.* x *lutzii*		Sxl
Sitka x unknown hybrid	*P. sitchensis* x *?*		Sxs
Yew	***Taxus***	**T**	
western yew	*Taxus brevifolia*		Tw
NATIVE HARDWOODS			
Alder	***Alnus***	**D**	
red alder	*A. rubra*		Dr
Apple	***Malus***	**U**	
Pacific crab apple	*Malus fusca*		Up
Aspen, Cottonwood or Poplar	***Populus***	**A**	
poplar	*P. balsamifera*		Ac
balsam poplar	*P. b.* ssp. *balsamifera*		Acb
black cottonwood	*P. b.* ssp. *trichocarpa*		Act
hybrid poplars	*P.* spp.		Ax
trembling aspen	*P. tremuloides*		At
Arbutus	***Arbutus***	**R**	
Arbutus	*Arbutus menziesii*		Ra
Birch	***Betula***	**E**	
Alaska paper birch	*B. neoalaskana*		Ea
Alaska x paper birch hybrid	*B.* x *winteri*		Exp
paper birch	*B. papyrifera*		Ep
water birch	*B. occidentalis*		Ew
Cascara	***Rhamnus***	**K**	
cascara	*R. purshiana*		Kc

Common Name	Scientific Name	Codes	
Cherry	***Prunus***	**V**	
bitter cherry	*P. emarginata*		Vb
choke cherry	*P. virginiana*		Vv
pin cherry	*P. pensylvanica*		Vp
Dogwood	***Cornus***	**G**	
Pacific dogwood	*Cornus nuttallii*		Gp
Maple	***Acer***	**M**	
bigleaf maple	*A. macrophyllum*		Mb
vine maple	*A. circinatum*		Mv
Oak	***Quercus***	**Q**	
Garry oak	*Q. garryana*		Qg
Willow	***Salix* spp.**	**W**	
Bebb's willow	*S. bebbiana*		Wb
Pacific willow	*S. lucida*		Wp
peachleaf willow	*S. amygdaloides*		Wa
pussy willow	*S. discolor*		Wd
Scouler's willow	*S. scouleriana*		Ws
Sitka willow	*S. sitchensis*		Wt
UNKNOWNS			
Unknown		**X**	
Unknown conifer			Xc
Unknown hardwood			Xh
OTHERS			
Other tree, not on list		**Z**	
Other conifer			Zc
Other hardwood			Zh
EXOTICS			
Apple	*Malus*	**U**	
apple	*Malus pumila*		Ua
Aspen, Cottonwood or Poplar	***Populus***	**A**	
*southern cottonwood	*P. deltoides*		Ad
Birch	***Betula***	**E**	
European birch	*B. pendula*		Ee
silver birch	*B. pubescens*		Es
Cherry	***Prunus***	**V**	
sweet cherry	*P. avium*		Vs
Cypress	***Chamaecyparis***	**Y**	
*Port Orford-cedar	*C. lawsoniana*		Yp

Common Name	Scientific Name	Codes	
Fir (Balsam)	***Abies***	**B**	
*balsam fir	*A. balsamea*		Bb
noble fir	*A. procera*		Bp
*Shasta red fir	A. magnifica var. shastensis		Bm
*white fir	A. concolor		Bc
Maple	***Acer***	**M**	
box elder	*A. negundo*		Me
*Norway maple	*A. platanoides*		Mn
*Sycamore maple	*A. pseudoplatanus*		Ms
Other exotics			
*incense-cedar	Calocedrus decurrens		Oa
*giant sequoia	*Sequoiadendron giganteum*		Ob
*coast redwood	*Sequoia sempervirens*		Oc
European mountain-ash	*Sorbus aucuparia*		Od
Siberian elm	*Ulmus pumila*		Oe
common pear	*Pyrus communis*		Of
Oregon ash	*Fraxinus latifolia*		Og
Pine	***Pinus***	**P**	
*Monterey pine	*P. radiata*		Pm
*red pine	*P. resinosa*		Pr
*sugar pine	*P. lambertiana*		Ps
Oak	***Quercus***	**Q**	
*English oak	*Q. robur*		Qe
Spruce	***Picea***	**S**	
*Norway spruce	*P. abies*		Sn

Appendix D - Low Woody Species and Intermediate Life Forms

From Habitat Monitoring Committee 1990

Scientific Name	Common Name	Genus Code	Species Code
Andromeda polifolia	bog-rosemary	ANDR	POL
Anemone multifida	cut-leaved anemone	ANEM	MUL
Apocynum androsaemifolium	spreading dogbane	APOC	AND
Apocynum cannabinum	hemp dogbane	APOC	CAN
Apocynum sibiricum	clasping-leaved dogbane	APOC	SIB
Arctostaphylos alpina	alpine bearberry	ARCT	ALP
Arctostaphylos rubra	red bearberry	ARCT	RUB
Arctostaphylos uva-ursi	kinnikinnick	ARCT	UVA
Aruncus dioicus	goatsbeard	ARUN	DIO
Asclepias ovalifolia	oak-leaf milkweed	ASCL	OVA
Asclepias speciosus	showy milkweed	ASCL	SPE
Cassiope lycopodioides	club-moss mountain-heather	CASS	LYC
Cassiope mertensiana	white mountain-heather	CASS	MER
Cassiope stelleriana	Alaskan mountain-heather	CASS	STE
Cassiope tetragona	four-angled mountain-heather	CASS	TET
Chamaerhodos erecta	chamaerhodos	CHAM	ERE
Chimaphila menziesii	Menzies' pipsissewa	CHIM	MEN
Chimaphila umbellata	prince's pine	CHIM	UMB
Comandra umbellata	pale comandra	COMA	UMB
Cornus canadensis	bunchberry	CORN	CAN
Cornus suecica	bog bunchberry	CORN	SUE
Cornus unalaschkensis	cordilleran bunchberry	CORN	UNA
Draba spp.	draba	DRABA	
Dryas drummondii	yellow mountain-avens	DRYA	DRU
Dryas integrifolia	entire-leaved mountain-avens	DRYA	INT
Dryas octopetala	white mountain-avens	DRYA	OCT
Empetrum nigrum	crowberry	EMPE	NIG
Eriogonum androscaceum	androsace buckwheat	ERIO	AND
Eriogonum flavum	yellow buckwheat	ERIO	FLA
Eriogonum heracleoides	parsnip-flowered buckwheat	ERIO	HER
Eriogonum niveum	snow buckwheat	ERIO	NIV

Scientific Name	Common Name	Genus Code	Species Code
Eriogonum ovalifolium	cushion buckwheat	ERIO	OVA
Eriogonum pauciflorum	few-flowered buckwheat	ERIO	PAU
Eriogonum umbellatum	sulfur buckwheat	ERIO	UMB
Fragaria chiloensis	coastal strawberry	FRAG	CHI
Fragana vesca	wood strawberry	FRAG	VES
Fragaria virginiana	wild strawberry	FRAG	VIR
Galium boreale	northern bedstraw	GALI	BOR
Gaultheria humifusa	alpine wintergreen	GAUL	HUM
Gaultheria hispidula	creeping snowberry	GAUL	HIS
Gaultheria ovatifolia	western tea-berry	GAUL	OVA
Geocaulon lividum	bastard toad-flax	GEOC	LIV
Kalmia microphylla	alpine bog-laurel	KALM	MIC
Linnaea borealis	twinflower	LINN	BOR
Lithospermum incisum	yellow gromwell	LITH	INC
Lithospermum ruderale	lemonweed	LITH	RUD
Loiseleuria procumbens	alpine-azalea	LOIS	PRO
Luetkea pectinata	partridgefoot	LUET	PEC
Orthilia secunda	one-sided wintergreen	ORTH	SEC
Penstemon davidsonii	Davidson's penstemon	PENS	DAV
Penstemon ellipticus	oval-leaved penstemon	PENS	ELL
Phlox caespitosa	tufted phlox	PHLO	CAE
Phyllodoce empetriformis	pink mountain-heather	PHYL	EMP
Phyllodoce glanduliflora	yellow mountain-heather	PHYL	GLA
Polygonum cuspidatum	Japanese knotweed	POLY	CUS
Polygonum paronychia	beach knotweed	POLY	PAR
Polygonum polystachyum	Himalayan knotweed	POLY	POL
Polygonum sachalinense	giant knotweed	POLY	SAC
Pyrola spp.	wintergreens	PYROLA	
Rhododendron lapponicum	lapland rosebay	RHOD	LAP
Rubus arcticus	dwarf nagoonberry	RUBU	ARC
Rubus chamaemorus	cloudberry	RUBU	CHA
Rubus lasiococcus	dwarf bramble	RUBU	LAS
Rubus nivalis	snow bramble	RUBU	NIV
Rubus pedatus	five-leaved bramble	RUBU	PED
Rubus ursinus	trailing blackberry	RUBU	URS
Salix artica	arctic willow	SALI	ARC
Salix cascadensis	Cascade willow	SALI	CAS

Scientific Name	Common Name	Genus Code	Species Code
Salix polaris	polar willow	SALI	POL
Salix reticulata	netted willow	SALI	RET
Salix stolonifera	stoloniferous willow	SALI	STO
Saxifraga bronchialis	spotted saxifrage	SAXI	BRO
Saxifraga cespitosa	tufted saxifrage	SAXI	CES
Saxifraga flagellaris	stoloniferous saxifrage	SAXI	FLA
Saxifraga oppositifolia	purple mountain saxifrage	SAXI	OPP
Saxifraga tricuspidata	three-toothed saxifrage	SAXI	TRI
Sibbaldia procumbens	sibbaldia	SIBB	PRO
Vaccinium caespitosum	dwarf blueberry	VACC	CAE
Vaccinium myrtillus	low bilberry	VACC	MYT*
Vaccinium oxycoccus syn. *Oxycoccus oxycoccos*	bog cranberry	OXYC	OXY
Vaccinium scoparium	grouseberry	VACC	SCO
Vaccinium vitis-idaea	lingonberry	VACC	VIT
* VACCMYR is *V. myrtilloides*; *V. myrtillus* defaults to next letter, so code is VACCMYT			

Appendix E - Discussion of the B.C. Land Classification Scheme

The B.C. Land Cover Classification Scheme was based on user needs and compatibility with present and proposed classification systems. This report describes the similarities and differences between the B.C. system and other systems, and provides the reasoning for divergence when it occurs.

The systems used for comparison and attempted compatibility are the Alaska Vegetation Classification System (Viereck et al. 1992), the Alberta Vegetation Inventory Draft Standards Manual (Alberta Forestry, Lands and Wildlife 1992), the Canadian Vegetation Classification System (National Vegetation Working Group 1990), and the proposed Forest Definitions and Classifications to be Employed for Global Forest Resource Assessment 2000, produced for the Forest Resources Division of the Food and Agriculture Organization of the United Nations (FAO) (Bones 1993). For comparison purposes the systems will be referred to as Alaska, Alberta, Canadian, and FAO.

After the last draft of this classification was prepared, a copy was obtained of the Standardized National Vegetation Classification System Final Draft (November 1994) prepared by The Nature Conservancy for the United States Department of Interior National Biological Survey and National Park Service (NBS/NPS).

The NBS/NPS Vegetation Mapping Program provides a comprehensive vegetation classification system which is being assessed by many agencies in the United States. Because it was not available during design of the B.C. classification scheme it was not used for comparison. When a final version is available, the B.C. scheme may be revisited to promote further compatibility.

The Alaska system is structured from specific to general; it is based on aggregation of plant communities, which are then grouped into broader classes. The other systems—Alberta, Canadian, and B.C.—are organized from general to specific, initially making broad classification splits, then adding detail to each unit.

For comparison purposes each step or level will be addressed separately in the following discussion.

Level 1 - Vegetated or Not

Level 1 provides a classification break into Vegetated or Non-Vegetated. A 5% break is proposed for the B.C. classification. The Alberta and FAO systems use a 5% break, while the Canadian and Alaska systems use a 2% break. The NBS/NPS system uses 1% as the lowest cover for its sparsely vegetated class.

The B.C. working group thought that a 2% break was difficult to determine accurately from aerial photographs, and that a 5% break would be more accurate and therefore preferable.

NON-VEGETATED POLYGONS

The B.C. classification uses a first-level break into Vegetated or Non-Vegetated land. The Non-Vegetated class is further divided into Land or Water.

The Canadian and FAO systems use a first-level break into Land or Water. The Alaska classification does not break out Water as an initial class, but identifies Aquatic Vegetation at a lower level in the hierarchy.

The B.C. working group felt the initial break between Vegetated and Non-Vegetated provided a less complex and more user-friendly hierarchy than using water versus land as the initial break.

The Non-Vegetated portion of the classification is not discussed further in this section of the report.

VEGETATED POLYGONS

Level 2 - Dominant Vegetation Type - Treed or Non-Treed

In the B.C. Scheme, a polygon is considered Treed if at least 10% of the area is covered in trees. Earlier drafts used the terms 'Forested' or 'Non-Forested', but the working group felt that the term 'treed' better represented what was being classified—vegetation cover with trees as one form of vegetation. 'Forest' was seen as a term describing a condition with numerous attributes beyond merely tree cover.

The 10% break between treed land versus another vegetative category is consistent with the Alaska, Alberta, Canadian, and NBS/NPS systems. The FAO system defines the Treed class as an area with vegetation more than 5% of the surface cover, and Coniferous, Broadleaf, or Bamboos and Palms, or a combination of the three make up 50% of the total surface cover, or the three make up 20-50% of the cover, and the vegetation does not qualify as Shrubs, Herbs, or Nonvascular. (This was described as forest land in previous FAO systems.)

The FAO system classifies the cover based on the dominant vegetation with categories for trees, shrubs, herbs, and nonvascular. The FAO report was not completely clear when various cover types would take precedence. J. Bones (pers. comm. January 1995), author of the FAO report, indicated that a top-down classification was intended. Thus if a polygon meets the criteria for trees, it is classed as Trees. If not, it is assessed by the shrub criteria. If the shrub criteria are not met, it is assessed by the herb criteria, and finally by the nonvascular criteria. The FAO will have a final report prepared by May or June of 1995 (pers. comm. Joe Lowe 1994). Further consultation with the FAO group is warranted to foster compatibility.

Level 3 - Landscape Position - Wetland, Upland, or Alpine

At this level the B.C. classification provides more detail than the Alaskan, Alberta, Canadian, or FAO systems. The other systems rely on vegetation cover and do not provide a landscape level. The B.C. working group felt that land managers would find this additional level of detail useful for data analysis and interpretation.

Level 4 - Vegetation Type

Once the polygon is classed as Treed or Non-Treed and as Wetland, Upland, or Alpine, it is further classified by the type of vegetation within the unit.

Treed units are divided into three groups: Coniferous, Broadleaf, and Mixed. This follows both the Alberta and Alaskan systems, except that those systems use 'needleleaf' instead of 'coniferous' as the class name. The Canadian system uses Deciduous, Evergreen, and Mixed categories. Using 'evergreen' as a class causes some difficulties as some conifers are not evergreen (e.g., larch) and some broadleaf species are evergreen (e.g., arbutus). The FAO system uses Coniferous and Broadleaf classes.

The B.C. working group felt that Coniferous, Broadleaf, and Mixed classes provided the most recognizable terms to describe the categories. Previous drafts used Needleleaf to describe the coniferous class.

The classification breaks used in the B.C. system (75%) are the same as those in the Alaska, Alberta, and Canadian systems. The FAO system does not define a percentage composition break between 'coniferous' and 'broadleaf' classes.

Non-Treed units are divided into Shrubs, Herbs, and Bryoids, which is generally consistent with the other systems. Each cover type will be addressed separately.

Shrubs are defined as multi-stemmed woody perennial plants, both evergreen and deciduous. The B.C. classification uses a 2 m break for Tall versus Low Shrub classes. This is different from the Alaska and Canadian breaks. The Canadian system uses Deciduous versus Evergreen shrubs with no height differentiation. The Alaska system uses 1.5 m and 20 cm breaks between Tall, Low, and Dwarf categories. The FAO system does not indicate any subdivisions within the shrub category.

The 2 m break used in the B.C. classification has been used by wildlife managers since 1980 and has been useful in estimating ungulate browse potential. Because the actual shrub heights are estimated for each polygon, and not recorded by class, other classification breaks could be queried.

For a polygon to be classed as Vegetated-Non-Treed-(either Wetland, Upland, or Alpine)-Shrub it must have more than 5% total vegetation, less than 10% crown cover of tree species, have 20% total ground cover in shrubs, or shrubs more than 1/3 of the total vegetation. This follows the Alberta system. The Alaskan classification uses a 25% shrub cover as the classification break, with no minimum percentage. The Canadian system uses a 10% shrub cover break if they are the tallest stratum, or shrubs constitute a minimum of 50% of the vegetation of similar height. The FAO system requires a minimum of 5% vegetation and shrubs make up more than 50% of the total surface cover, or when the two make up 5% to 50% of the cover and the vegetation condition does not qualify as Trees, Herbs, or Nonvascular.

Again it will be useful to determine the FAO methodology prior to making a final commitment on class breaks. The B.C. breaks were chosen to provide information to wildlife managers on shrub abundance. The shrub category supersedes herbs and bryoids if there is

greater than 20% shrub cover. This was done to provide wildlife managers with information on shrub abundance over herb or bryoid abundance.

Herbs are defined for the B.C. system as vascular plants without a woody stem, including ferns, fern allies, some dwarf woody plants (see Appendix D) grasses, and grasslike plants. The Canadian system definition is not as detailed as it does not include dwarf woody plants in the herb category. The Alaska system breaks herbs into three categories - Graminoid Herbaceous (includes grasses and grasslike plants), Forb Herbaceous (herbaceous plants other than grasses or grasslike plants), and Bryoid Herbaceous (includes mosses and lichens). The FAO system does not define the Herb category beyond inclusion of graminoids.

The B.C. system provides additional categories within the Herb category, based on the abundance of forbs and graminoids. This additional detail was considered useful for range and wildlife managers when assessing habitat potential.

The break points for the Herb category are the same as the Alberta system. For a polygon to be classed as Herb it must have more than 5% total vegetation, less than 10% crown cover of tree species, have a minimum of 20% ground cover of herbs, or herbs constitute more than 1/3 of the total vegetation, and have less than 20% shrub cover.

The Canadian system uses a 2% minimum cover of herbs with a maximum nonvascular/herb ratio of two or less. The Alaska system describes the Herbaceous class as having up to 25% shrub cover. The FAO system suggests that for an area to be classed as Herb, vegetation must make up more than 5% of the surface cover, and forbs or graminoids or the two in combination make up more than 50% of the total surface cover, or when the two make up 5% to 50% of the cover, and the vegetative condition does not qualify as Trees, Shrubs, or Nonvascular.

All these breaks are somewhat arbitrary. The B.C. break was felt to represent the interests of range and wildlife managers while being operationally feasible for airphoto interpretation.

The B.C. Scheme defines **Bryoids** as bryophytes (mosses, liverworts, and hornworts) or lichens (foliose, or fruticose, but not crustose). The Canadian and the FAO systems use the term 'nonvascular' for this group of plants. The Alberta system uses the class Bryophytes without reference to lichens. The Alaska system separates mosses and lichens as individual levels under Bryoid Herbaceous.

For a polygon to be classed as Vegetated-Non-Treed-(either Wetland, Upland, or Alpine)-Bryoid it must have more than 5% total vegetation, less than 10% crown cover of tree species, and have more than 50% of the vegetation cover as bryoids, while herb and shrub cover must be less than 20%. This follows the Alberta system. The Canadian system uses a 2% minimum plant cover where nonvascular plants must cover a minimum of twice as much area as herbs. The Alaska system uses the term 'dominated by' for classifying herbs, mosses, and lichens. The FAO system suggests the area to be classed Nonvascular when vegetation makes up more than 5% of the surface cover, and lichens and/or bryophytes make up more than 50% of the total surface cover, or the two make up 5% to 50% of the cover, and the vegetation does not qualify as Trees, Shrubs, or Herbs.

Level 5 - Density Class

Treed vegetation types have three density classes:

Dense - tree cover is 61–100% crown closure
Open - tree cover is 26–60% crown closure
Sparse - tree cover is 10–25% crown closure

The B.C. system is consistent with the Alaska, Alberta, Canadian, and NBS/NPS systems. The NBS/NPS system has the same breaks with different names: Forest, Woodland, and Sparse Woodland. The FAO system does not identify density classes.

Shrubs and herb vegetation types have three density classes:

Dense - shrub or herb cover is 61–100%
Open - shrub or herb cover is 26–60%
Sparse - shrub or herb cover is less than <26%

The Alaska system uses a different strategy for describing density. It has two classes for shrubs: Closed (>75%), and Open (25-74%). There are no density breaks for herbaceous vegetation. The Alberta system does not show breaks at this level. The B.C. and Canadian systems use the same density categories for shrubs and herbs as for trees. The NBS/NPS system breaks shrubs into two height classes, each with two density classes (100-25% and 25-10%). The NBS/NPS system has no density break for the herbaceous level. The FAO system does not identify density classes.

Non-Treed Bryoid vegetation type has two density classes:

Closed - cover of bryoids greater than 50% of the polygon
Open - cover of bryoids ≤50% of the polygon

The Alberta and Alaska classifications have no density class for this level. The Canadian system uses the same breaks as for trees. The FAO system does not identify density classes.

The density classes are meant to provide managers with a useful picture of the vegetation on-site. The density breaks used in B.C. are for reporting purposes and could be presented differently as all information will be collected by estimated cover and height values rather than by discrete classes.

Index

A

Airport 13
Alpine 7, 11, 14

B

Beach 12
Bedrock 12
Blockfield 12
Bryoid 9
Bryoid - Lichens 9
Bryoid - Moss 9
Burned Area 12

C

categories
  Non-Vegetated Land polygons 11
  Non-Vegetated Water polygons 14
codes
  B.C. Tree Code List 23
  Land Cover Class 3
  low woody species 27
cover types
  Non-Vegetated polygons 11
Cutbank 13

D

density classes
  Bryoid - Closed 10
  Bryoid - Open 10
  Dense 9
  Open 10
  Sparse 10
  Tree, Shrub Herb polygons 9

E

Exposed Land 11
Exposed Soil 12

G

Glacier 11, 12
Gravel Pit 13

H

Herb 9
Herb - Forb 9
Herb - Graminoid 9

L

Lake 14
Lake Sediment 12
Land 10
Land Base 6
  Non-Vegetated 6
  Unreported 6
  Vegetated 6
Land Cover Classification
  coding system 3
  comparisons 30
  decision chart 2
  definitions 18
  Introduction 1
  Non-Vegetated diagram 5
  polygon attributes 2
  procedures 6
  uses 1
  Vegetated diagram 4
land cover types
  Land 10
  Non-Treed 6

Non-Vegetated polygons 10
Treed 6
Vegetated polygons 6
Water 10
landscape positions
Alpine 7, 11
Upland 7, 11
Vegetated polygons 7
Water polygons 13
Wetland 7, 10
Lava Bed 12
low woody species list 27

M

Mine Spoil 12
Moraine 13
Mudflat Sediment 13

N

Non-Treed
Bryoid polygons 9
Herb polygons 8
polygons 6
Shrub polygons 8
Non-Vegetated
categories 11
Land polygons 10
polygons 6
Non-Vegetated polygons 10

O

Ocean 14
Open Pit Mine 13

P

Parking 13
polygon attributes 2
Pond or Lake Sediment 12

R

Railway Surface 13
Reservoir 14
Reservoir Margin 12
River Sediment 12
River/Stream 14
Road Surface 13
Rock/Rubble 11
Rubble, Talus, Blockfield 12
Rubbly Mine Spoils 12

S

Shrub Low 8
Shrub Tall 8
Snow Cover 11
Snow/Ice 11
Stream 14

T

Tailings 13
Tree Code List 23
Treed
Broadleaf 8
Coniferous 7
Mixed 8
polygons 6

U

Unreported polygons 6
Upland 7, 14
Upland 11
Urban 13

V

Vegetated polygons 6
vegetation types 7
Bryoid 9

Bryoid - Lichens 9
Bryoid - Moss 9
Herb 9
Herb - Forb 9
Herb - Graminoid 9
Non-Treed 8
Shrub Low 8
Shrub Tall 8
Treed - Broadleaf 8
Treed - Coniferous 7
Treed - Mixed 8

W

Water 10
Wetland 7, 10, 14